Space Weather Forecast

Issued on Sunday, 21 January 2024 at 00:19 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Large Earth-directed CME. Moderate Geomagnetic Storm G2 Likely, Chance Strong G3 Monday 22 January. Risk easing into Tuesday 23 January.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was low over the UTC day of Saturday 20 January, with occasional Common-class flares observed. These flares peaked with an impulsive mid-ranking event at 20/1434UTC from a possible newly-developing region in the northeastern quadrant. The other notable flare of the 24 hours was a long-period Common-class flare at 20/0934UTC associated with a 'filament eruption' from the southeast-centre of the Sun.

There were up to eleven sunspot regions noted in the period, with the main changes being the emergence and proliferation of spots in regions in the southeast and southwest, as well as significant infill of spots in the nominally most complex region - a third group in the northeast.

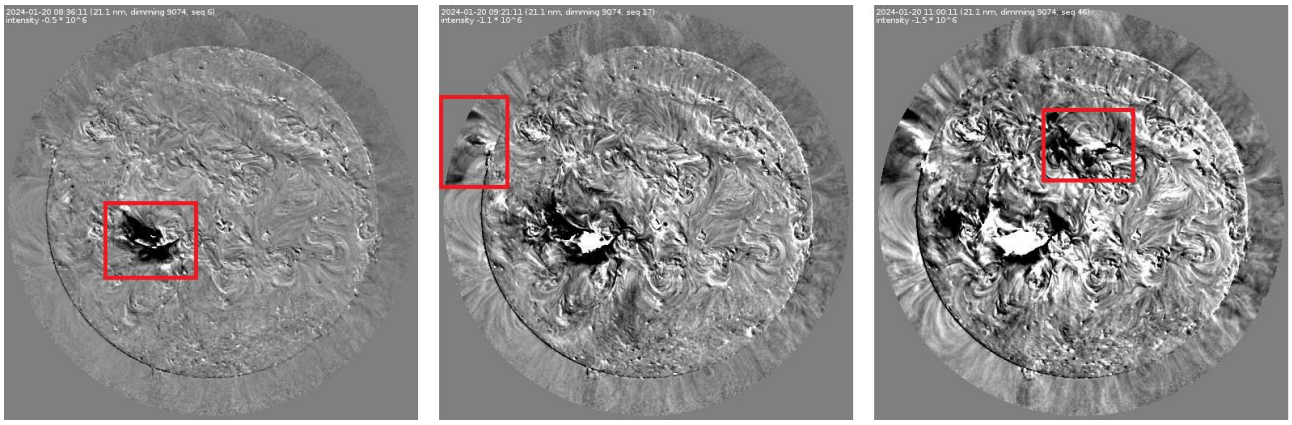

Figure 1: Trio of SIDC ROB-processed time integrated extreme UV ‘coronal dimmings’ (often signatures of CMEs), showing boxed in red respectively the 20/0840UTC southeast-central ‘filament eruption’; a near-concurrent northeast ‘prominence eruption’ and the 20/1030UTC north central filament-related dimming. At the time of writing, only the first of these events features as an Earth-directed CME.

The most notable event of the period was a large 'filament eruption' (arc of plasma from the facing side of the Sun) from the central southeast quadrant at 20/0840UTC, with the filament's centroid near S10E10. Possibly polluting this event on satellite imagery was a near-simultaneous 'prominence eruption' (arc of plasma from the Sun's edge) from near N20E80. Ejecta seen heading slightly south and east of the Sun-Earth line on subsequent satellite imagery interlaces with a more eastward cone from the prominence, although both seem to be travelling at similar speeds which further complicates analyses. A third filament-related disturbance occurred in the north-central disc at 20/1030UTC near N15W00, although near infrared imagery suggests that the filament

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responsible remained anchored, and no obvious further contribution to CME ejecta was visible in imagery.

The latest MOSWOC CME modelling suggests an arrival time of the southeast central CME at Earth of 22/1500UTC, however errors in its intervening windspeed (an overly fast background field) mean that arrival around 22/1800UTC is perhaps preferred, which happens to also be more centrally located within the MOSWOC Enlil ensemble. This forecast remains under review given possible interaction with the more eastward CME and possible (self-)corrections to MOSWOC Enlil's handling of fast winds.

Solar Wind / Geomagnetic Activity: Solar winds were roughly constant at slightly elevated levels. The solar wind speed showed a very slight waning tendency, as did the number of particles in the solar wind. The associated magnetic field was at background levels. The net result of the above solar wind measures was for quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: There is a daily chance of isolated Moderate-class flares, with a roughly level trend.

Solar Wind / Geomagnetic Activity: A fast wind is due inside the first 24-hour period, giving a slight chance of Minor Geomagnetic Storm G1 before beginning to wane in the first half of the UTC working week. The CME from the 20/0840UTC southeast-central filament eruption now dominates considerations. A most likely arrival time of 22/1800UTC is suggested, with Moderate Geomagnetic Storm G2 Likely and with a Chance of Strong G3, continuing into the first half of the UTC day of Tuesday 23 January before abating to Quiet conditions by midweek UTC.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	80	50	1
Strong	G3	No	1	30	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	25	25	30	30
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	2	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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